Drinking Water Health Issues

Lead in Drinking Water – Lead and Copper Rule (LCR)

LCR Background

- Drinking water is only one of the possible routes of lead exposure.
- Lead and copper enter drinking water primarily through plumbing materials: fixtures, lead service lines, solder and lead goosenecks (short segments of lead pipes that connect the water main to the customer's service line).
- The treatment technique for the Lead and Copper rule requires systems to monitor drinking water at customer taps. If lead concentrations exceed an action level of 15 ppb or copper concentrations exceed an action level of 1.3 ppm in more than 10% of customer taps sampled, the system must undertake a number of actions to control corrosion.
- An action level exceedance is not a violation but can trigger other requirements that include public education, water quality parameter monitoring, corrosion control treatment, source water monitoring, lead service line replacement and follow-up lead and copper monitoring.
- In Region 3, approximately 6,700 public water systems (4,300 community and 2,400 non-transient non-community water systems) serving 29 million people are required to comply with the Lead and Copper Rule. All community water systems and non-transient non-community water systems are subject to the LCR requirements.

Recent Activities

EPA is actively working with states to understand how the LCR is currently being implemented. I want to thank the states for their cooperation in this effort. We know it took an incredible amount of work to get this done and we appreciate the time and attention states took to gather the requested information.

- In January 2016, EPA requested that the primacy agencies provide detailed information on actions taken in response to 327 action level exceedances in Region 3 (2400 nationally) between fiscal year 2013 and 2015, and to respond to a series of questions related to current implementation protocol.
- In late February, EPA sent letters to governors and state commissioners focused on ensuring consistency with EPA regulations and guidance. These letters asked states to work with us to improve transparency in rule implementation and to increase public information on lead service line locations.
- In addition to these efforts to increase oversight, EPA published a memo to provide clarification of recommended tap sampling procedures under the lead and copper rule. Specifically:
    - Not to remove aerators prior to collecting samples,
    - Not to flush the tap prior to starting the 6 hour stagnation time required under the regulation,
    - Use of wide-mouth bottles which allow for a higher flow rate during sample collection.

- On July 6, EPA published a website including a letter from the Administrator to the states, all of the state responses to EPA's February 29 letter, a fact sheet summarizing the responses, and links to relevant state drinking water websites.
- Recent news reports have focused on inappropriate adherence to the lead and copper rule, specifically with regard to sampling techniques and selection of tier 1 sample sites.

Tier Criteria

For community water systems, lead and copper tap water samples must be collected from Tier 1 sites when they exist in the distribution system.

Tier 1. Single family structures that contain lead pipes, or copper pipes with lead solder **installed after 1982,** and/or are served by lead service lines.

Tier 2. Buildings and multiple-family residences that contain lead pipes, or copper pipes with lead solder **installed after 1982,** and/or are served by lead service lines.

Tier 3. Single family structures, constructed as a single family residence and currently used as either a residence or business, that contain copper pipes with lead solder **installed before 1983.**

A General Summary of Region 3 State Responses to EPA's letters to the water commissioners:

- All states confirmed in their responses that their protocols and procedures are fully consistent with the federal LCR and applicable EPA guidance.
- Many states shared that they have posted or are planning to post LCR sampling protocols and guidance to the state's websites.
- States identified challenges regarding EPA's request to post the materials evaluation, locations and maps of lead service lines, and maps of lead service lines on the public water systems and/or state website.
    - Public water supply systems utilized materials evaluations in the development of LCR compliance sampling plans in 1991, but the rule did not require the public water system to submit this information to primacy agencies.

Future Oversight:

- We will work with states to promote drinking water testing, data sharing, and appropriate response in schools that are not regulated drinking water systems.
- Region 3 will be conducting lead and copper file reviews in the states with a focus on LCR implementation at schools, daycare centers and large community water systems – with an emphasis on ensuring appropriate sampling locations and proper actions following action level exceedances.
- We continue to stress the importance of ensuring that public water supply systems adhere to EPA guidance and regulation and conduct appropriate follow-up to action level exceedances, using enforcement when appropriate.
- EPA is considering long-term revisions to the Lead and Copper Rule to improve public health protection by making substantive changes and streamlining the rule.

- The National Drinking Water Advisory Committee (NDWAC) provided their recommendations to EPA in December 2015. The Lead and Copper Rule Long-Term Revisions Work Group is considering the recommendations during its current deliberations to develop a proposed revised rule before the end of calendar year 2016.
- EPA plans to issue a proposed rule early in 2017 and a final rule in 2019.
- The main issues under discussion for revision are: tap sampling, lead action levels, lead service line replacement, corrosion control treatment, and public education.

- By the end of this year, we will release a summary of our progress and a national action plan for the future.

Emerging Health Issues

Perfluorinated Compounds

- The Unregulated Contaminant Monitoring Rule (UCMR) list 3 Perfluorinated compound (PFC) data was gathered from those water systems serving over 10,000 persons with each entry point sampled during approximately the past 3 years. The data was completed and submitted by December 2015, and a final report is still pending. However, PFC's were found in only approximately 1% of the samples nationwide, with PFOS found detected both above the minimum reporting limits and above the provisional health advisory, but PFOA detected but not above the provisional health advisory.

Ex. 5 Deliberative Process (DP) **Ex. 5 Deliberative Process (DP)**

- A new life-time health advisory was issued on May 19,2016, and replaces the existing provisional health advisory for PFOS and PFOA

  - The health advisory sets a combined value of 0.07 ppb (or 70 parts per trillion) for PFOA and PFOS combined. It does not include the potential additive effects of other PFC's that were sampled as part of the UCMR.
  - The value sets a 70 year life-time exposure value, to be protective of nursing mothers and infants, and therefore is protective of all other populations and ages.
  - The Health Advisory was developed to provide the best available science, to enable the states and local authorities to make decisions when these chemicals are present in water systems.
  - A total of 63 water systems had one or more wells above the new Heath advisory. In our Region we had 9 water systems identified, using UCMR and other data, but site investigations have shown far many more public and private wells impacted. To date we have about 170 private wells and over 20 public wells either offline or on again with GAC treatment.

- State specific information

- D.C. – No impacts identified to date
- Delaware- 3 water systems impacted with one system back online with treatment, the other wells remain offline.
- Maryland- No water systems identified to date
- Pennsylvania- 5 water systems (approximately 16 wells) impacted in Harrisburg, Bucks, and Montgomery Counties
- Virginia- No large systems identified but one Federal Facility water system is off line at Fentress Naval Air Station near Chesapeake, VA
- West Virginia- Ongoing investigation in the Washington Works area with DuPont providing new treatment to Vienna and additional investigation of additional water systems in WV and Ohio, also impacts to Martinsburg with an unknown source of PFOS.

- Lab Capacity

  - There were only a few laboratories certified through the UCMR process as capable of analyzing samples for PFCs using EPA Method 537. These labs currently have significant capacity issues with current sampling requested by water systems and Federal facility activities.
  - There aren't any current plans by the Office Water to initiate any additional Lab certification programs, it would be up to states to accreditate labs for these, and any other unregulated contaminants through the National Environmental Laboratory Accreditation Program (NELAP) There are modifications to Method 537 that may also be reliable for drinking water analysis, but QA/QC has not been done.
  - Several EPA labs are working towards capabilities to run method 537 and/or modified 537 methods for both drinking water and other media (soil, wastewater, etc.).

- Household treatment units.

  - Studies completed in 2005 in Minnesota looked at the effectiveness of multiple units however their studies used limits of detection far greater than these revised health advisory levels. Contacts at Minnesota indicated they don't have plans to test at lower levels at this time.
  - NSF International is the main third party certification organization for home treatment devices including whole house and point of use devices.
  - NSF had been reporting on their hot line that units capable of removing VOC's should be suitable, but have now confirmed they have not tested any units. They do plan to create a testing program in the near future and encourage review of various types of point of use and whole house units.
  - Units installed by DuPont and federal facilities will have ongoing monitoring to determine their effectiveness. Some units used in WV and Ohio have been in operation for over ten years. DuPont has used a five year replacement cycle, not because of breakthrough but because of manufacture's warranties. We

expect more data as additional units are installed and sampled over time, and known concentrations.

Cyanotoxins and Harmful Algal Blooms

Background

- The prevalence and duration of HABs in freshwater is rapidly expanding in the U.S. and worldwide. The water quality, human health and socioeconomic impacts of HABs can be significant.
- Some HABs can produce toxins that are toxic to liver, kidney and nervous system functions in humans and animals. These toxins, when found in source waters, can contaminate drinking water supplies if that water is not adequately treated.
- The challenges that HABs pose to public drinking water systems include an incomplete understanding of how to prevent, predict, analyze, monitor and treat toxins in drinking water; determining how to effectively communicate risk to stakeholders; and developing and implementing resource-efficient methods to reduce the risks posed by HABs in source waters.
- EPA is working to address many of these challenges, and in November 2015, released the "Algal Toxin Risk Assessment and Management Strategic Plan for Drinking Water" in accordance with Section 1459 of the Safe Drinking Water Act, as amended by the Drinking Water Protection Act. This plan outlines EPA's steps and timelines for activities that address: algal toxins and their human health effects; health advisories; factors likely to cause HABs; analytical methods; frequency of monitoring; treatment options; and source water protection practices.

HAB Health Advisories

- In June 2015, EPA issued 10-Day Drinking Water Health Advisories for two cyanobacterial toxins: [HYPERLINK "https://www.epa.gov/sites/production/files/2015-06/documents/microcystins-report-2015.pdf"] and [HYPERLINK "https://www.epa.gov/sites/production/files/2015-06/documents/cylindrospermopsin-report-2015.pdf"].
- Drinking water is the primary source of exposure for these advisories. Exposure may also occur by ingestion of toxin contaminated food, including consumption of fish; by inhalation and dermal contact during bathing or showering; and recreational activities.
- EPA recommends health advisory levels at or below 0.3 µg/L for microcystins and 0.7 µg/L for cylindrospermopsin in drinking water for children pre-school age and younger (less than six years old). For school-age children through adults, the recommended health advisory levels for drinking water are at or below 1.6 µg/L for microcystins and 3.0 µg/L for cylindrospermopsin.
- EPA issued in June 2015 *Recommendations to Public Water Systems to Manage Cyanotoxins in Drinking Water.* These guidelines help water systems in all aspects of a harmful algal bloom event, from monitoring to treatment to public communications.

Other EPA HABs Activity

- In November 2015, *EPA issued the Algal Toxin Risk Assessment and Management Strategic Plan for Drinking Water*. This plan presents examples of recently completed and ongoing HAB-related activities and provides steps and timelines for intended future EPA activities. These ongoing and future activities outline EPA's plan for the next few months through the next five years and beyond.
- EPA headquarters is currently working on a HABs risk communication plan. The target audience is public water systems. The document will outline effective methods/language for public communication when there is a HABs incident. No estimated timeframe for publication as of yet.
- EPA headquarters is also currently developing Clean Water Act §304(a) recreational ambient water quality criteria for cyanotoxins. Draft expected to be released in 2016.
- Region 3 participates in the Cyanobacteria Assessment Network task force. This workgroup meets monthly to share HABs strategies and activities among the EPA regions, headquarters, and other federal agencies (focusing on both recreational and drinking waters).
- Region 3 participates in the HABs in Drinking Water Response Team. This seasonal workgroup, exclusively focusing on current HABs incidents in drinking water sources, meets when necessary (and fortunately hasn't had the need to meet this season as of yet). This workgroup is comprised of regional offices and headquarters.
- Region 3 is working with a contractor (Cadmus) to develop a Regional Response Plan for drinking water (not recreational waters) HABs incidents in our region. This response plan would outline Region 3's actions over all phases of a potential incident, with a focus on monitoring, communication to/from EPA Region 3, advisories to consecutive systems and customers, and engaging partner agencies in incident response.
- Drinking water source protection partnerships in Region 3 are concerned about HABs and many are exploring prevention, monitoring, preparedness and coordinated risk/response communication. Region 3 is leading the Potomac Drinking Water Source Protection Partnership's Algae Workgroup.

Ohio River Bloom 2015

- Beginning in August 2015, Regions 3, 4, and 5 participated with the Ohio River states, the Army Corps of Engineers, and the Ohio River Sanitation Commission (ORSANCO) in the response to the Ohio River HAB incident.
- Reports indicated that the bloom stretched across as much as 640 miles of the river, almost two-thirds of its 931 total miles. Impacted water systems along the river spent approximately $2 million in additional treatment costs.
- The Region 3 Wheeling office assisted with collection of Ohio River samples and boat surveys throughout the incident.
- Impacted states cited many lessons learned as a result of this substantial multi-agency collaborative, including the need for enhanced communication between partners and consistent communication from state agencies to the public.

UCMR

- The purpose of UCMR is to collect national occurrence data for unregulated drinking water contaminants that do not have health-based standards set under the Safe Drinking Water Act and are known or anticipated to occur in public water supplies (treated drinking water).
- PWSs serving >10,000 people as well as a nationally representative sample of PWSs serving ≤10,000 people must monitor
- EPA pays testing and analysis costs for small water systems. Large water systems pay all costs.
- EPA has gone through three cycles: UCMR1 (2001-2005) covering 26 contaminants. UCMR2 (2007-2011): 25 contaminants. UCMR3 (2012-2016): 30 contaminants.
- The fourth cycle (UCMR4) is being proposed from 2017 to 2021 with 30 contaminants to be monitored.
- EPA directly implemented the monitoring program with voluntary assistance from States, through mutually agreed upon, non-binding Partnership Agreements.
- Occurrence information is used to support Agency's determination on whether a contaminant should be regulated or not (regulatory determination). If the determination is to regulate, the Agency has 36 months to propose and finalize a National Primary Drinking Water Regulation including the establishment of a drinking water standard or Maximum Contaminant Level (MCL). Ex. 5 Deliberative Process (DP)

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Regulatory Determinations

UCMR data have been used to support Agency's regulatory determination efforts on 29 contaminants.

- **Perchlorat**e was determined to be regulated : used in rocket fuels and munitions, also naturally occurring in some fertilizers; thyroid effects - inhibition of iodine uptake

Currently, the Agency is in the process of making final determinations on:

- **Strontium (the stable ^{88}Sr isotope):**
  Naturally occurring, bone development effects – decreased bone calcification (replacing calcium in bone)

- **Chlorate:**
  Decomposition of hypochlorite solution, impurity of chlorine dioxide, and formed as disinfection by-products; thyroid effects - thyroid gland follicular cell hypertrophy (enlargement of cells) in thyroid gland

- **Six nitrosamines (NDMA, NDEA, NDBA, NDEA, NMEA, NPYR):**
  Formed as intermediates and byproducts in chemical synthesis and manufacture of rubber, leather, and plastics; also formed as disinfection by-products; likely human carcinogens with mutagenic mode of actions

UCMR3 Monitoring List

UCMR 3 List 1			UCMR 3 List 2
7 VOCs	**6 PFCs**	**6 Metals**	**7 Pharmaceuticals**
chloromethane (methyl chloride)	perfluorooctane sulfonic acid (PFOS)	cobalt	17-β-estradiol
bromomethane (methyl bromide)	perfluorooctanoic acid (PFOA)	molybdenum	17-α-ethynylestradiol (ethinyl estradiol)
chlorodifluoromethane (HCFC-22)	perfluorononanoic acid (PFNA)	strontium	16-α-hydroxyestradiol (estriol)
bromochloromethane (halon 1011)	perfluorohexane sulfonic acid (PFHxS)	vanadium	equilin
1,1-dichloroethane	perfluoroheptanoic acid (PFHpA)	chromium	estrone
1,2,3-trichloropropane	perfluorobutanesulfonic acid (PFBS)	chromium-6	testosterone
1,3-butadiene			4-androstene-3,17-dione
SOC	**Oxyhalide Anion**		**UCMR3 List 3**
1,4-dioxane	Chlorate		enterovirus
			Norovirus

UCMR3 Detects

As of April 1, 2016, more than one million sample results have been submitted to EPA by 4,108 large water systems and 1,549 small water systems. Data reporting is ongoing until end of 2016. Final NCOD data will be posted at EPA Website in January or February of 2017.

Metals (except for cobalt) are frequently detected (> Minimum Reporting Level) since they are naturally occurring and ubiquitous. For example, strontium are detected in 100% of samples and PWSs monitored. Cr-6 is the next most frequently detected (76% of samples and 89% of PWSs), followed by Cr (51% of samples and 74% of PWSs).

Strontium: detected in 100% of samples, 100% of PWSs
Chromium-6: detected in 76% of samples, 89% of PWSs
Chromium: detected in 51% of samples, 74% of PWSs
Vanadium: detected in 60% of samples, 74% of PWSs
Molybdenum: detected in 41% of samples, 52% of PWSs
Cobalt: detected in 1.3% of samples, 5.0% of PWSs

Chlorate: detected in 55% of samples, 69% of PWSs
1,4-Dioxane: detected in 12% of samples, 22% of PWSs
1,2,3-TCP: detected in 0.69% of samples, 1.3% of PWSs

1,1-dichloroethane: detected in 2.3% of samples, 4.9% of PWSs
HCFC-22: detected in 2.3% of samples, 5.8% of PWSs
Halon 1011: detected in 1.8% of samples, 6.2% of PWSs
Chloromethane: detected in 0.8% of samples, 2.8% of PWSs
Bromomethane: detected in 0.3% of samples, 1.0% of PWSs
1,3-Butadiene: detected in 0.003% of samples, 0.02% of PWSs

PFCs:

PFOA: detected in 0.98% of samples, 2.2% of PWSs
PFOS: detected in 0.79% of samples, 1.9% of PWSs

PFHpA: detected in 0.64% of samples, 1.7% of PWSs
PFHxS: detected in 0.56% of samples, 1.1% of PWSs
PFNA: detected in 0.05% of samples, 0.3% of PWSs
PFBS: detected in 0.05% of samples, 0.2% of PWSs

Pharmaceuticals:

Percentages of detections range from non-detect to 0.84% of sample results and non-detect to 6.2% of PWSs monitored

4-androstene-3,17-dione: detected in 0.84% of samples, 6.2% of PWSs
Testosterone: detected in 0.57% of samples, 4.9% of PWSs
17-alpha-ethynylestradiol: detected in 0.04% of samples, 0.3% of PWSs
17-beta-estradiol: detected in 0.03% of samples, 0.1% of PWSs
Estriol: detected in 0.02% of samples, 0.2% of PWSs
Equilin and estrone were not detected.

The detection of a UCMR 3 contaminant above the MRL does not represent cause for concern, in and of itself. Rather, the implications of the detection should be judged considering health effects information (which is often still under development or being refined for unregulated contaminants).

Health-based Reference Concentrations (RC) were established for 21 of 30 UCMR3 contaminants. Reference Concentrations are not Action Levels, nor do they represent EPA's intent to establish a future drinking water regulation for the contaminant. They are established under the UCMR3 to provide a context within which to better interpret the sample results.

- % of sample results > RC & % of PWSs have results > RC

Chlorate: 15.6% of samples & 38.1% of PWSs have results >210 µg/L
1,4-Dioxane: 3.0% of samples & 7.0% of PWSs have results >0.35 µg/L (10^{-6} cancer risk)
Strontium: 2.8% of samples & 5.7%of PWSs have results >1,500 µg/L
Vanadium: 2.7% of samples & 3.3% of PWSs have results >21 µg/L
1,2,3-TCP: 0.7% of samples & 1.3% of PWSs have results >0.0004 µg/L (10^{-6} cancer risk)
0.5% of samples & 1.1% of PWSs have results >0.04 µg/L (10^{-4} cancer risk)

PFOA: 0.09% of samples & 0.3% of PWSs have results >0.07 µg/L
PFOS: 0.3% of samples & 0.9% of PWSs have results >0.07 µg/L

Molybdenum: 0.2% of samples & 0.8% of PWSs have results >40 µg/L
Chloromethane: 0.05% of samples & 0.1% of PWSs have results >140 µg/L
Cobalt: 0.005% of samples & 0.06% of PWSs have results >70 µg/L
1,3-Butadiene: 0.003% of samples & 0.02% of PWSs have results >0.0103 µg/L(10^{-6} cancer risk)
1,1-dichloroethane: 0.003% of samples & 0.02% of PWSs have results >6.14µg/L (10^{-6} cancer risk)
Cobalt: 0.005% of samples & 0.06% of PWSs have results >70 µg/L
17β-estradiol: 0.009% of samples & 0.08% of PWSs have results >0.0009 µg/L(10^{-6} cancer risk)

UCMR4

- Proposed UCMR4 rule published December 11, 2015
- Comment period ended February 9, 2016

- Final UCMR4 rule expected January 2017
- Monitoring period: 1/1/2018 – 12/31/2020
- Approximately 36 states have submitted their Partnership Agreements. EPA is working with the rest of states, U.S. tribes and territories.
- All Region III states have signed a Partnership Agreement, committing varying degrees of assistance in the implementation of the rule.
- Changed sampling timeframe from a 12 month period to a 9-month period to better target contaminant occurrence. Systems will sample March-November (skipping December, January, and February). Substantial public comments were received on this change.

Proposed UCMR4 Contaminants:

Proposed UCMR4 List 1		
10 Cyanotoxins	**2 Metals**	**3 DBPs**
"total microcystins"	Germanium	HAA5 (regulated)
microcystin-LA	Manganese	HAA6Br
microcystin-LF	**9 Pesticides/Insecticides/herbicides/fungicides**	HAA9
microcystin-LR	alpha-hexachlorocyclohexane	**3 Alcohols**
microcystin-LY	Chlorpyrifos	1-butanol
microcystin-RR	Dimethipin	2-propen-1-ol
microcystin-YR	Ethoprop	2-methoxyethanol
Nodularin	Oxyfluorfen	**3 Semivolatile Organic Compounds**
anatoxin-a	Profenofos	butylated hydroxyanisole
cylindrospermopsin	Tebuconazole	o-toluidine
	total permethrin (cis- & trans-)	Quinolone
	Tribufos	

Proposed UCMR4 - HAAs

Analyte	*MCLG*		
Bromochloroacetic acid *(BCAA)*	Not Available	HAA6Br	HAA9
Bromodichloroacetic acid *(BDCAA)*	Not Available		
Chlorodibromoacetic acid *(CDBAA)*	Not Available		
Tribromoacetic acid *(TBAA)*	Not Available		
Monobromoacetic acid *(MBAA)*	Not Available		
Dibromoacetic acid *(DBAA)*	Not Available		
Dichloroacetic acid *(DCAA)*	0 µg/L		HAA5 = Group MCL 60 µg/L
Monochloroacetic acid *(MCAA)*	70 µg/L		
Trichloroacetic acid *(TCAA)*	20 µg/L		